

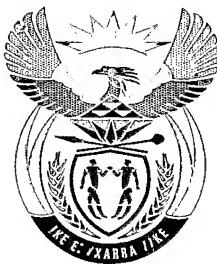
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Certificate

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This is to certify that

the documents annexed hereto are true copies of:

Application forms P.1 and P.3, the provisional specification and drawings of
South African Patent Application No. 2004/0537 as originally filed in the
Republic of South Africa on 23 January 2004 in the name of WALLET,
Grant Alan David for an invention entitled: "BUFFERING MOVEMENT OF
MOVABLE MEMBERS".

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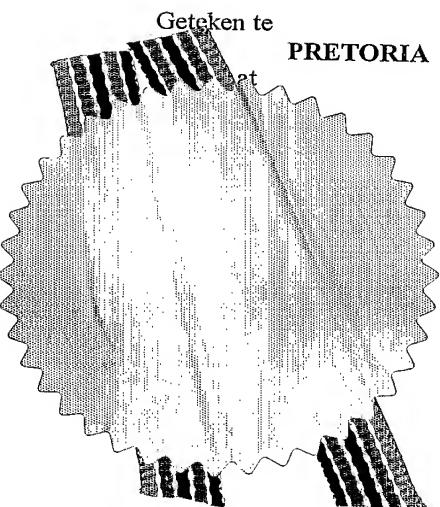
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March 2005

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REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978
APPLICATION FOR A PATENT AND
ACKNOWLEDGEMENT OF RECEIPT
(Section 30(1) Regulation 22)

FORM P.1
(to be lodged in duplicate)

23.01.04

R 06000

THE GRANT OF A PATENT IS HEREBY REQUESTED BY THE UNDERMENTIONED APPLICANT
ON THE BASIS OF THE PRESENT APPLICATION FILED IN DUPLICATE

21 01 PATENT APPLICATION NO 200470537

A&A REF: V16091 AS/JW/dcd

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54 TITLE OF INVENTION

BUFFERING MOVEMENT OF MOVABLE MEMBERS

Only the items marked with an "X" in the blocks below are applicable.

- THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2. The earliest priority claimed is
Country: No: Date:
 THE APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO 21 01
 THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND BASED ON
APPLICATION NO 21 01

THIS APPLICATION IS ACCCOMPANIED BY:

- A single copy of a provisional specification of 12 pages
 Drawings of 4 sheets
 Publication particulars and abstract (Form P.8 in duplicate) (for complete only)
 A copy of Figure of the drawings (if any) for the abstract (for complete only)
 An assignment of invention
 Certified priority document(s). (State quantity)
 Translation of the priority document(s)
 An assignment of priority rights
 A copy of Form P.2 and the specification of RSA Patent Application No
 Form P.2 in duplicate
 A declaration and power of attorney on Form P.3 - To follow later
 Request for ante-dating on Form P.4
 Request for classification on Form P.9
 Request for delay of acceptance on Form P.4
 Extra copy of informal drawings (for complete only)

21 01

74 ADDRESS FOR SERVICE: Adams & Adams, Pretoria

Dated this 23rd day of January 2004


AV vR SCHWEIZER
ADAMS & ADAMS
APPLICANTS PATENT ATTORNEYS

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A&A P201

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FORM P6

REPUBLIC OF SOUTH AFRICA
Patents Act, 1978

PROVISIONAL SPECIFICATION
(Section 30 (1) - Regulation 27)

21	01	OFFICIAL APPLICATION NO
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22	LODGING DATE
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• 2004 / 0537

23 January 2004

71	FULL NAME(S) OF APPLICANT(S)
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WALLETT, Grant Alan David

72	FULL NAME(S) OF INVENTOR(S)
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WALLETT, Grant Alan David

54	TITLE OF INVENTION
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BUFFERING MOVEMENT OF MOVABLE MEMBERS

2004 / 0537

THIS INVENTION relates, to a bucket for a mechanical shovel or -digger. It also relates to mechanical shovel or -digger including the bucket.

It is expected that this invention will primarily be used in the context of hingeably movable trap doors of mechanical shovels or -diggers and, accordingly, such application should particularly be borne in mind when considering this specification.

In accordance with one aspect of the invention, broadly, there is provided a bucket for a mechanical shovel or -digger, the bucket having a hollow body provide with an inlet for receiving rubble like fragmented material into its interior and an outlet for discharging said material therefrom, the bucket having, secured to the body, a door which is movable between a closed condition in which it closes the outlet of the bucket so that said material can be held therein, and an open condition in which it permits discharge under gravity of said material from bucket, the bucket also including at least one buffering device for buffering movement of the door, the device being connected between the body and the door of the bucket and being in the form of a fluid-containing extensible and retractable piston-and-cylinder assembly secured to the bucket for extension and retraction in response to

movement of the door, the piston-and-cylinder assembly also including a fluid flow control assembly which permits relatively unrestricted fluid flow through the assembly during opening of the door and which throttles fluid flow through the assembly during closing of the door, such that movement of the door towards its open condition is relatively unrestricted and movement of the door towards its closed condition is buffered.

More particularly, in accordance with this aspect of the invention there is provided a bucket for a mechanical shovel or -digger, the shovel or bucket having a hollow body provided with an inlet for receiving rubble or like fragmented material into its interior and an outlet for discharging said material therefrom, the bucket having, secured to the body, a door which is movable under gravity between a closed condition in which it closes the bucket so that said material can be held therein, and an open condition in which it permits discharge of said material from the bucket under gravity, the bucket also including at least one buffering device for buffering movement of the door, the device being connected between the body and the door of the bucket, each buffering device including a cylinder and a piston longitudinally slidably received in the cylinder, the piston having a piston rod projecting longitudinally from an end of the cylinder and a piston head located in the cylinder and slidably sealingly engaging the wall of the cylinder so that two compartments containing a fluid are defined respectively between the piston head and the ends of the cylinder such that each device is in the form of a telescopically extensible and retractable piston-and-cylinder assembly, each said assembly being connected between the body of the door and of the bucket such that each piston-

and-cylinder assembly extends and retracts in response to movement of the door, the device further including a fluid flow control assembly in flow communication with at least one of the compartments, the flow control assembly permitting relatively unrestricted flow of the fluid during opening of the door, and throttling flow of the fluid during closing of the door, such that movement of the door towards its open condition is relatively unrestricted and movement of the door towards its closed condition is buffered.

Advantageously, the two compartments are in flow communication with each other via the fluid flow control assembly such that fluid flows from one of the compartments to the other compartment via the flow control assembly both in response to extension of the piston-and cylinder assembly and in response to retraction of the piston-and-cylinder assembly respectively during opening and closing of the door.

The door may be hingedly secured to the bucket such that it hinges between its closed condition and its open condition, with each of the cylinder and the projecting end of the piston rod being provided with a securing formation by means of which the piston-and-cylinder assembly is hingedly secured between the bucket and the door. Advantageously, the door will define the floor or part of the floor of the bucket.

The bucket may further include a releasable latch for retaining the door in its closed condition.

The fluid flow control assembly may include a one-directional or non-return valve permitting flow of fluid there to flow control assembly only in the direction corresponding to opening of the door, and may include a throttling device, such as a throttle valve, for throttling fluid flow through to the flow control assembly in the direction corresponding to closing of the door. The throttling may be adjustable for adjusting the fluid flow rate through the assembly, hence permitting adjustment of the degree of buffering and of the speed at which the door closes. The fluid flow control assembly may further include a pressure relief mechanism, e.g. a pressure relief valve, for overriding the action of the throttling device when the pressure of the fluid as it flows through the flow control assembly exceeds a predetermined threshold pressure, to discontinue the throttling.

While the fluid flow control assembly may in principle be located in the piston head, it is conveniently located alongside the cylinder, in either case placing the two compartments in communication with each other.

The piston-and-cylinder assembly may be connected to the body of the bucket and to the door such that opening of the door causes the piston-and-cylinder assembly to retract and closing of the door causes it to extend.

The piston-and-cylinder assembly may be a hydraulically operable assembly, with the working fluid being a liquid.

In accordance with another aspect of the invention there is provided a mechanical shovel or -digger which includes a bucket as hereinbefore defined, a support structure supporting the bucket such that it is movable between a charging condition in which rubble or like fragmented material can be scooped into the bucket via its inlet, and a discharging condition in which said material can be discharged from the bucket via its outlet under gravity, and a displacement assembly for displacing the bucket and, optionally, for displacing its support structure.

The invention is now described, by way of example, with reference to the accompanying diagrammatic drawings.

In the drawings:

Figure 1 shows a schematic side elevation of part of a mechanical shovel or-digger in accordance with the invention;

Figure 2 shows a schematic side elevation of a bucket in accordance with the invention, the shovel or bucket forming part of the mechanical shovel or-digger shown in Figure 1;

Figure 3 shows a schematic axial section of a device for buffering movement of a door of the bucket of Figure 2 in accordance with the invention; and

Figure 4 shows a flow diagram of a fluid flow control assembly forming part of the device shown in Figure 3.

With reference to Figure 1 of the drawings, a mechanical shovel or-digger, only part of which is shown, is generally indicated by reference numeral 10.

The shovel or-digger includes a bucket 12 (see also Figure 2) for receiving fragmented material such as rubble to be moved and by means of which said material can be scooped up.

The bucket 12 has an open top 14 forming and inlet via which material is received into its interior. The open top 14 is defined by upper edges of a body 16 of the bucket 12, which body is defined by side walls. The bucket 12 also includes a floor provided by a door in the form of a trap door 18, which trap door 18 is hingedly secured by means of a hinge 20 to the body 16 of the bucket 12.

A buffering device in the form of a hydraulically operated telescopically extensible and retractable piston-and-cylinder assembly 22(see also Figure 3) is pivotally converted about a horizontal axis to a bracket forming an extension 20 of the trap door 18 and about a horizontal axis to the body 16 of the bucket 12 for controlling movement of the trap door 18 as hereinafter described. The piston-and-cylinder assembly 22 is arranged such that it extends in response to closing of the trap door 18 and such that it retracts in response to opening of the trap door 18.

The trap door 18 is movable, under gravity, between a closed condition (Figures 1 and 2) in which it forms a floor of the bucket 12, and an open condition (not shown) in which it is pivoted downwardly away from its closed condition to permit discharge under gravity of fragmented material from bucket 12. The bucket 12 also includes a latch (not shown) for retaining the trap door 18 in its closed condition.

The shovel or digger 10 further includes a cantilever arm 21 having a free end on which a sheave or wheel 24 is rotatably mounted. A steel rope 26 is deflected over the sheave or wheel 24 and is secured to upper edges of side walls of the body 16 by means of pivotable securing levers 28. The arm 21 and its associated cable 26 provide for lifting and lowering of the bucket 12.

The shovel or digger 10 also includes a further cantilever arm 30 located below the arm 21, a free end of the arm 30 being pivotally connected about a horizontal axis to a bracket 32 mounted on a lower part of the body 16. An extensible and retractable connection 34 (shown schematically), which is typically in the form of a hydraulically operable telescopically extensible and retractable piston-and cylinder-assembly, connects the upper part of the body 16 to the arm 30. This extensible and retractable connection 34 is pivotably connected to the body 16 and to the arm 30 at a position spaced from the bucket 12 about horizontal axis such that when the connection 34 extends, the bucket 12 is pivoted, about the axis of its connection to the arm 30 at the bracket 32, to a charging condition in which its open top 14 faces more or less horizontally such that teeth 35 projecting from the upper periphery of the body 16 extend more or less horizontally and can dig into fragmented material such as rubble and such that the material is received in the bucket 12. When the connection 34 retracts, it pivots the bucket 12 to the condition, as shown in Figure 1, in which the latched closed trap door 18 serves a floor of the bucket 12, and in which condition the material which has been scooped up into the bucket 12 is held therein.

Referring now to Figure 3 of the drawings, the piston and cylinder assembly 22 includes a piston 36 and an elongated cylinder 38 within which the piston 36 is longitudinally slidably received. The piston 36 has a rod 39 having an outwardly projecting end 40 which projects from one end of the cylinder 38, and a piston head 42 which is sealingly axially slidably received in the cylinder 38. Sealing between the piston head 42 and a wall 43 of the cylinder 38 is effected by means of two axially spaced annular seals 44, 46.

The cylinder 38 has an end 48 which is closed off by means of an end plate 50 which incorporates a connecting bracket 52 for pivotable connection to the body 16 of the bucket 12. The opposite end of the cylinder 38, in turn, is sealed off by an end plate 54 which includes a spigot or plug received spigot-fashion into said opposite end of the cylinder 38. The end plate 54 is provided with a central opening 56 receiving the rod 39 of the piston 36. Two axially spaced annular seals 58 ensure a sealing abutment between plug of the end plate 54 and the wall 43 of the cylinder 38. In turn, four axially spaced annular seals 60 effect sealing in the central opening 56 between plug of the end plate 54, and the shaft 39.

The projecting end 40 of the rod 39 of piston 36 is also provided with a connecting bracket 62 for pivotable connection thereof to the bracket 20 of the trap door 18.

The piston head 42 divides the interior of the cylinder 38 into two compartments respectively indicated by reference numerals 64 and 66 in which a hydraulic fluid is received. Openings 68 and 70 provided in the wall 43 of the cylinder 38 respectively provide access into the respective compartments 64, 66.

The piston-and-cylinder assembly 22 further includes a fluid flow control assembly 72 (see also Figure 4) for controlling flow of the hydraulic fluid between the two compartments 64, 66.

The two compartments 64, 66 are in communication with each other by means of fluid flow lines 74, 76 which are joined together by the fluid flow control assembly 72.

The fluid flow control assembly 72 includes a one-directional or non - return valve 78 permitting relatively free or unrestricted fluid flow in the direction indicated by arrow 80, i.e. fluid flow from the compartment 64 to the compartment 66, such that retraction of the piston-and-cylinder assembly 22 is relatively unrestricted. In use, opening of the trap door 18 is thus relatively unrestricted by the assembly 22.

Fluid flow in the direction indicated by arrow 81, i.e fluid flow from the compartment 66 to the compartment 64 in response to extension of the piston-and-cylinder assembly 22 when the trap door 18 is closed, is throttled by means of an adjustable throttle valve 82 provided in a fluid flow line 84 which bridges or by - passes the non - return valve 78, i.e. it is in parallel therewith. The fluid flow control

assembly 72 further includes a relief valve 86 provided in parallel with both the non-return valve 78 and the throttle valve 82, which relief valve 86 acts as a safety valve when a permitted threshold pressure of hydraulic fluid flowing through the throttle valve 82 is exceeded. The relief valve 86 is located in a fluid flow line 88 in parallel with the fluid flow lines 74 and 84.

In use, when material has been received in the bucket 12 and the bucket 12 has been pivoted to the condition shown in Figure 1, the mechanical shovel or-digger 10 is moved to a position where the material is to be discharged. Upon discharge, the latch is released and the trap door 18 pivots under gravity towards its open condition, which pivoting movement is relatively unrestricted due to the particular configuration of the piston-and-cylinder assembly 22. Material thus discharges more or less freely and rapidly under gravity from the bucket 12. The mechanical shovel or-digger 10 is then moved back to an area from which material is to be removed and the bucket 12 is pivoted by means of the secondary arm 30 and moved to a required height by means of the steel rope 26 to a charging condition as hereinbefore described in which material can be scooped up.

Upon pivoting of the bucket 12 towards said charging condition in which material can be scooped up, the trap door 18 pivots under gravity towards its closed condition. Due to the particular configuration of the piston-and-cylinder assembly 22, such pivoting of the trap door 18 into its closed condition is buffered so that the trap door 18 closes in a cushioned and controlled fashion, thereby inhibiting or reducing damage to the mechanical shovel or digger 10 arising from excessive

shocks and vibrations which otherwise occur as the trap door 18 comes more or less forcibly into contact with the body 16 of the bucket 12 upon closing.

The invention as described and illustrated thus provides a device 22 which can be fitted to buckets 12 of mechanical shovels or diggers 10 and which device 22 can reduce damage to the shovels or diggers 10 arising from shocks and/or vibrations caused by the trap door 18 slamming closed against the body 16 of the bucket 12. Further, the device 22 can also reduce noise pollution.

DATED THIS 23rd day of JANUARY 2004

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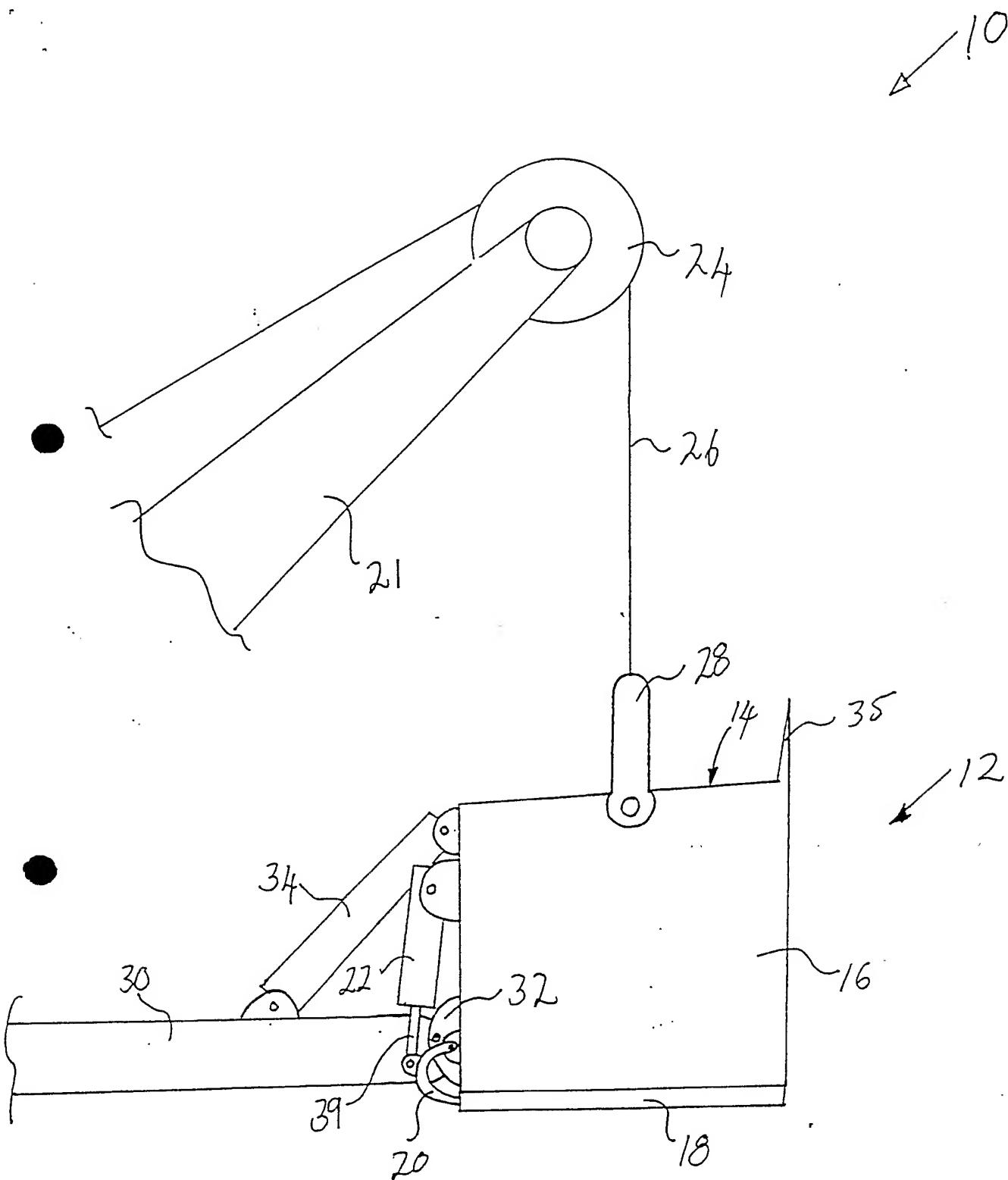


FIG.1


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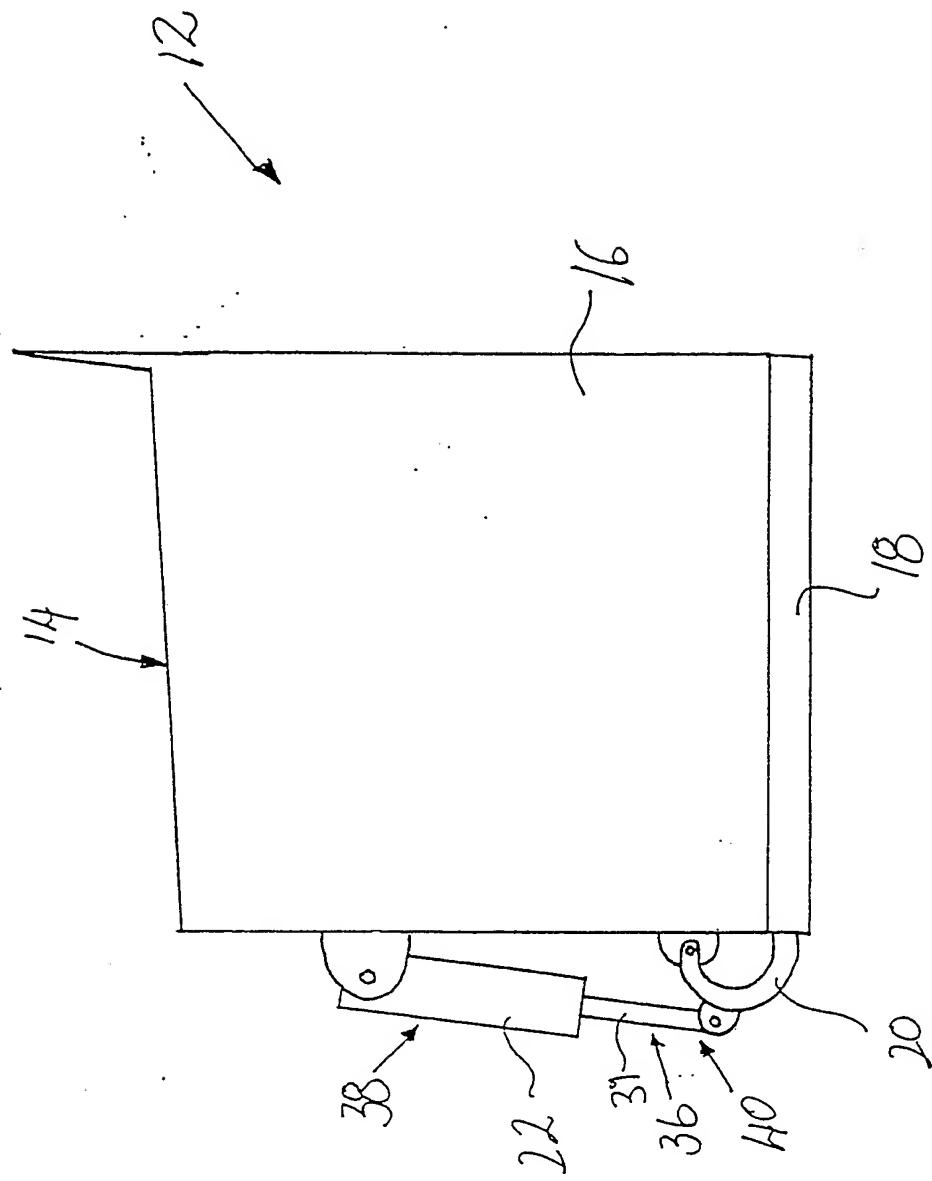


Fig 2


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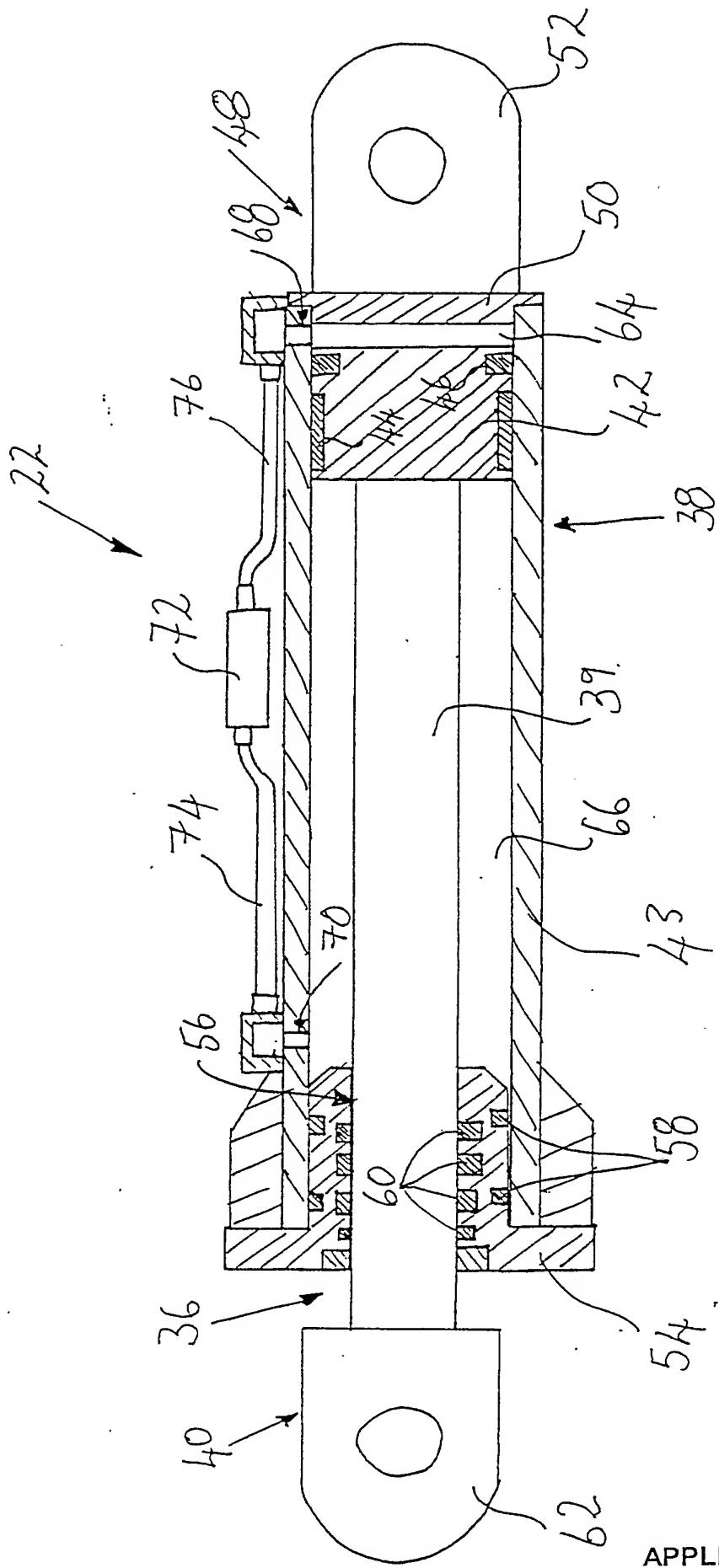
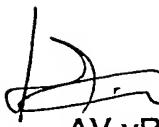


Fig 3


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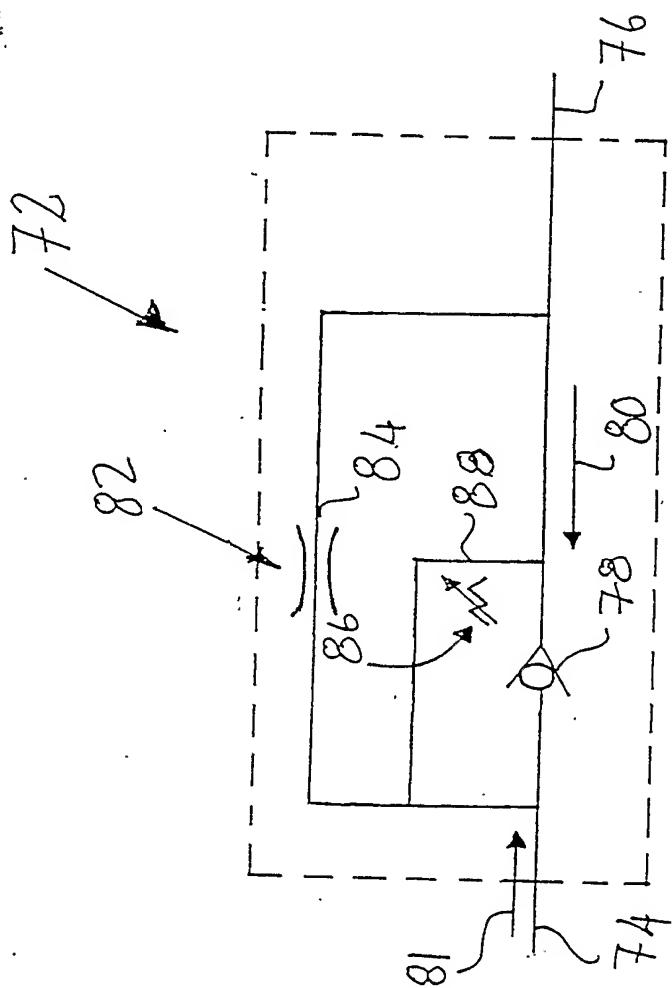


FIG 4

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